



## ELP and ESP Station Handout

### Rope Making

#### **INTRODUCTION**

This handout will teach you how to run the Rope Making station on an ELP or ESP day; you will also learn the history and craft of rope making as it would have been done at Sutter's Fort in the 1840s. Through the Rope Making station, your students will learn how to use a rope machine to make their own rope. They will also learn about the history of rope and discuss the contributions rope has made towards the development of civilization.

#### **HISTORY**

Rope was one of humankind's earliest tools. History records rope making as far back as 7,000 years ago, and it is also one of America's oldest industries. The materials that people used to make rope varied and depended on their location and the intended use of the rope. Rope has been made out of many things: hide, hair, plant fibers, tree bark, cotton wire, silk, and simple vines to name just a few. Twisting or braiding strands of these materials together made them stronger than single untwisted fibers. The first methods of rope making were similar to weaving plant fibers into mats and baskets. Fibers are spun into twine, and twine is used to make rope. The rope making operation is called "laying." In laying, the twine is led from a paddle for the desired length to the laying machine (rope maker) and back to the paddle. This is repeated until the desired thickness is achieved. Rope was (and is) used to build, hoist, haul, cross obstacles, support, tie, fish, hunt, snare food, fight, furnish, clothe and transport. Today there are hundreds of different types of ropes for a great variety of uses.

#### **The People**

Ancient people twisted strips of hide, sinew, hair, vines, and plant fibers into rope long before they learned to spin or weave. Rope making was a universal skill known in all tribes and civilizations. Braided ropes were used in Asia before 4,000 BC. Ropes were used to decorate pottery in southeastern Europe in 3,000 BC. The Mayas used rope to move the large blocks of stone they needed for building their marvelous temples. The ancient Egyptians developed rope making techniques in 2,500 BC which are still in use today. Some Native Americans chewed hide and sinew into strands that could be used for rope. Rope making in ancient India was so unique that only a special class of people made ropes. Homer frequently mentions rope in his Odyssey. The Romans even fabricated rope out of thin copper wire. In 14th century England, the first guilds of rope makers were established. Medieval monks made ropes to ring monastery bells and to use as belts. But it was the age of sailing ships that turned rope making into a vital industry. Phoenician ships were held together by rope. Columbus had 15 miles of rope on his ship. Records indicate the Emperor of China had rope made from ladies' hair. Hemp was planted along the watering holes of the western trails so that future pioneers could harvest it. Pioneers carried a rope machine when they came west for this purpose.





## **The Place**

Rope making was commonplace. Every community of any size had its ropewalk (places where ropes could be made by laborers who “walked” out the twists in the strands). The first American ropewalk was founded in Salem, Massachusetts in 1635. Rope making was a common colonial pursuit by 1700. Most ropewalks during this time were along the coast or in port towns because the greatest need for rope was in the fishing and sailing industries. Walks were often 900 feet or more. South England boasted a 2,000 foot rope walk. Philadelphia had several competing rope walks. Smaller ropewalks served the rural areas. Farmers made some ropes for their own use out of flax; but they were of a lesser quality than those made in colonial ropewalks. The first ropewalk in the west was established by Hiram and Alfred Tubbs in San Francisco. Ropewalks were found indoors and out and on sailing ships. Later, narrow sheds were built that were over 1,000 feet long and 30 feet wide. Three or four rope makers worked side by side in these ropewalks. Sheds were not heated in winter, nor were they closed during bad weather. The long wooden sheds, filled with dry fibrous material, were moved to locations outside of town, which was an added hardship for those who worked there. Rope makers had to be skilled artisans to produce quality ropes under these conditions. The entire rope making process was affected by the ability and experience of the rope maker. Although machines gradually replaced skilled rope makers, traditional techniques survived until after the Civil War.

## **SETTING UP THE ROPE MAKING STATION**

### **Place**

You can set up the rope making station in a variety of places around the fort. If your rope making station is paired with vaquero or another station, as teachers often choose to do, it is recommended you set up near that station.

### **Materials You Need to Bring**

- Twine – This twine is known as yarn in the rope making process. See the “Suppliers” section on page 7 of this handout for a list of sources from which twine can be obtained.
- Gloves are recommended but not required

### **Materials the Fort Provides**

- Rope machine (2 machines are available at the Fort)
- Yarn paddle
- Spinner hook
- Threader
- Scissors
- Table and chairs





## **MAKING THE ROPE**

This is a three person operation. When teaching the students how to make rope, have them be the ones doing the procedure and operating the machine while you supervise.

### **Safety Procedures**

1. Keep fingers and loose clothing away from moving parts such as the hooks and handle.
2. Wear gloves. Rope yarn often has splinters within the yarn.
3. Wash hands after making or handling new rope as it may contain oils or other chemicals.
4. If the crank "runs away" or spins out of control, let it go. Do not try to stop the movement.
5. Removing "whiskers" from finished rope by burning should always be done by an adult.
6. Operation of the rope making equipment should always be done under adult supervision.

### **1. Threading the Machine**

Follow the threading diagram on page 7 of this handout to string your yarn (twine) onto the paddle and rope machine. Start by drawing the yarn from the center (not the outside) of the roll of twine. Take this end and slide it into the left slot of the paddle. The yarn should then be held in place with the thumb of the hand holding the paddle. The yarn should then travel to the left hook of the rope machine. Loop it around the hook and then bring the yarn back to the left slot of the paddle. From the left slot it should travel up the back side of the paddle and then slide into the top slot of the paddle. From there it should travel to the top hook of the rope machine and then back again to the top slot of the paddle. Then take it down to the right slot of the paddle and then out to the right hook of the rope machine and back again to the right slot of the paddle. Then, leaving enough yarn to tie off, cut the yarn after it comes back through the right slot. Then tie together the two loose ends (the one held in place at the left slot and the end that you just brought through the right slot). After tying these two ends, trim the excess and save for the final tie on the other end (the last step).

### **2. Preparing to Spin the Strands**

Once the two loose ends of the yarn have been tied off on the back side of the paddle, place all three yarns on the back side of the paddle onto the spinner hook. Move the paddle forward slightly so that there is about 8 inches between the back side of the paddle and the spinner hook. Keep tension on the yarns with the spinner hook so that all the three strands have the same tension on them.

### **3. Manufacturing the Rope**

At this point, you should have one person holding the paddle handle, another holding the spinner hook and one more stationed by the crank of the rope machine. Have the rope machine operator start spinning the crank in a clockwise motion. The strands of yarn will begin to twist together. Ensure that you are continuing to keep a medium amount of tension on the rope. If the tension is too much, the yarn can snap and if there is not enough tension, the rope will not turn out well.





Once the three strands begin twisting together in the area between the paddle and the spinner hook, start moving the paddle forward towards the rope machine. The three strands will continue to twist together into one rope as you move the paddle forward.

#### **4. Finishing off the Rope**

When the paddle reaches the rope machine, stop turning the handle and remove the paddle. Then remove the strands from the left hook and the right hook and place them both on the top hook. You now have all three strands on the top hook of the rope machine. Now, while still holding the spinning hook so that there is a small amount of tension on the rope, give the machine two or three turns counter-clockwise to set the twist. Then remove the three strands from the top hook of the rope machine and tie them together by threading a short piece of yarn through all three strand loops. Trim the loose ends.

### **ADDITIONAL INFORMATION**

#### **Topics for discussion**

1. Importance of ropes in:
  - A. Obtaining food
  - B. Creating shelter
  - C. Making clothing
2. Use of ropes in construction of:
  - A. Buildings
  - B. Bridges
3. Effect of ropes on commerce due to use in:
  - A. Ships
  - B. Fishing nets and lines
4. Effect of ropes in agriculture due to use in:
  - A. Wells
  - B. Harnesses
5. Effect of ropes on travel due to use in:
  - A. Ships
  - B. Wagons
6. What would we do without rope?
7. What additional uses for rope can you think of?

#### **Terms**

Below are specialized terms relating to ropes. They may be of some help in understanding how to make rope.

- Abaca – The plant from which the fiber for “manila rope” is taken. Grown mostly in the Philippines.





- Against the Sun – In the counter-clockwise or left-handed direction. The opposite of turning a rope “with the sun.”
- Agave – The cactus-like plant from which sisal rope is made. Varieties of this plant grow in the Philippines, the East Indies, Africa, and Central and South America.
- Binder Twine – Light twine used in packaging.
- Baler Twine – Heavy twine used for baling straw or hay.
- Bitter End – The last or end of a rope or cable. Reaching the “bitter end” meant you had nothing left to work with.
- Braid – To interweave cord or rope.
- Coil – A spiral rope or to lay a rope down in a circular fashion.
- Cord – A small line made of several yarns, less than 1 inch in diameter. Also called “small stuff.”
- Cordage – A general term for all rope, cord, and line.
- Cow’s Tail – The frayed end of a rope.
- Fiber – The smallest threads used to make the yarns for cords and ropes.
- Hemp – A plant from the Cannabis family that produces a soft fiber. Once widely used in the United States for rope making, it is now illegal to grow in the U.S. It was also grown to make a cloth similar to linen.
- Jute – A plant with a soft fiber used for ropes, cords, burlap, and clothing. Grown mostly in India.
- Line – A common name (especially aboard ship) for various types of cordage.
- Manila – Rope made from abaca fiber.
- Mecate – A Mexican hair rope.
- Paddle – Wood tool used in making rope.
- Rope – Any line of more than 1 inch in circumference.
- Rope Machine – A mechanical device used to manufacture rope.
- Sisal – The fibrous material from the leaves of the agave plant. Commonly used to make rope.
- Strand – Two or more yarns twisted together in the opposite direction to that of the yarn itself.
- Whip – To lash the end of a rope to prevent it from unraveling or fraying.
- With the Sun – In the clockwise or right-handed direction. The opposite of turning a rope “against the sun.”
- Yarn – Any number of individual threads or fibers twisted together.

### **The Ropewalk**

This is a poem written by famous American poet Henry Wadsworth Longfellow. In the first two and last stanzas the poem describes a ropewalk, or rope making factory, which were historically very long, narrow lanes or buildings. The seven middle stanzas contrastingly describe several other situations and locations, all of which relate to different uses for rope.



In that building, long and low,  
With its windows all a-row,  
Like the port-holes of a hulk,  
Human spiders spin and spin,  
Backward down their threads so thin  
Dropping, each a hempen bulk.

At the end, an open door;  
Squares of sunshine on the floor  
Light the long and dusky lane;  
And the whirring of a wheel,  
Dull and drowsy, makes me feel  
All its spokes are in my brain.

Two fair maidens in a swing,  
Like white doves upon the wing,  
First before my vision pass;  
Laughing, as their gentle hands  
Closely clasp the twisted strands,  
At their shadow on the grass.

Then a booth of mountebanks,  
With its smell of tan and planks,  
And a girl poised high in air  
On a cord, in spangled dress,  
With a faded loveliness,  
And a weary look of care.

Then a homestead among farms,  
And a woman with bare arms  
Drawing water from a well;  
As the bucket mounts apace,  
With it mounts her own fair face,  
As at some magician's spell.

Then an old man in a tower,  
Ringing loud the noontide hour,  
While the rope coils round  
Like a serpent at his feet,  
And again, in swift retreat,  
Nearly lifts him from the ground.

Then within a prison-yard,  
Faces fixed, and stem, and hard,  
Laughter and indecent mirth;  
Ah! it is the gallows-tree!  
Breath of Christian charity  
Blow, and sweep it from the earth!

Then a school-boy, with his kite  
Gleaming in a sky of light,  
And an eager, upward look;  
Steeds pursued through lane and field;  
Fowlers with their snares concealed;  
And an angler by a brook.

Ships rejoicing in the breeze,  
Wrecks that float o'er unknown seas,  
Anchors dragged through faithless sand;  
Sea-fog drifting overhead,  
And, with lessening line and lead,  
Sailors feeling for the land.

All these scenes do I behold,  
These, and many left untold  
In that building long and low;  
While the wheel goes round and round;  
With a drowsy, dreamy sound,  
And the spinners backward go.

### For More Information

"Twisted Strands: Simple Machines and Rope Making in the Charlestown Navy Yard." Boston National Historical Park. 2005.

<https://www.nps.gov/bost/learn/education/upload/Twisted%20Strands.pdf>

## SUPPLIERS

The twine to use for rope making (often called “Binder Twine”) needs to be made of a natural fiber such as sisal. They are generally found at hardware stores. Below are just two examples of stores at which twine can be found and the product number for the twine that is recommended. It is recommended to get spools of twine that are 2,000 to 2,500 feet because that is enough for a class of 30 students.

- Home Depot – Product Number 18000
- Ace Hardware – Product Number 71459

## THREADING DIAGRAM

